AMENDMENT

Amendments to the Claims

A complete listing of the claims follows. Please amend claims 1, 3, 5, 6, 8-10, 12-14, and 18-22 as indicated below. All other claims remain as originally presented.

1. (Currently amended) A fault-tolerant server comprising:

(a) a communications link comprising a switching fabric, a first communications channel, and a second communications channel;

(b) a first computing element in electrical communication with the communications link, the first computing element providing a first output~~instruction~~ to the communications link;

(c) a second computing element in electrical communication with the communications link, the second computing element providing a second output~~instruction~~ to the communications link;

(d) a first local input-output (I/O) module~~subsystem~~ in electrical communication with the first computing element and the communications link; and

(e) a second local I/O module~~subsystem~~ in electrical communication with the second computing element and the communications link,

wherein at least one of the first local I/O module~~subsystem~~ and the second local I/O module~~subsystem~~ compares the first output~~instruction~~ and the second output~~instruction~~ and indicates a fault of at least one of the first computing element and the second computing element upon the detection of a miscompare of the first output~~instruction~~ and the second output~~instruction~~, and

wherein the first local I/O module~~subsystem~~ is in electrical communication with the second local I/O module~~subsystem~~ via a sync bus to synchronize the first local I/O module~~subsystem~~ and the second local I/O module~~subsystem~~, the synchronization of the first local I/O module and the second local I/O module providing a verification of state information about the first computing element and the second computing element.

2. (Original) The fault-tolerant server of claim 1 wherein each computing element further comprises a respective Central Processing Unit (CPU) and a respective local mass storage device.

3. (Currently amended) The fault-tolerant server of claim 2 wherein the ~~communications link further comprises a respective~~ switching fabric comprises:

a first switching fabric in electrical communication with the CPU of the first computing element; and

a second switching fabric in electrical communication with the CPU of the second computing element, wherein each respective ~~CPU and~~ switching fabric is in electrical communication with at least one of the first local I/O module~~subsystem~~ and the second local I/O module~~subsystem~~.

4. (Original) The fault-tolerant server of claim 1 further comprising a priority module to assign a priority to each respective computing element.

5. (Currently amended) The fault-tolerant server of claim 4 wherein each local I/O module~~subsystem~~ further comprises I/O fault-tolerant logic to determine whether at least one of the first computing element and the second computing element is faulty based on the priority.

6. (Currently amended) The fault-tolerant server of claim 1 wherein each local I/O module~~subsystem~~ further comprises I/O fault-tolerant logic to determine whether the first output~~instruction~~ and the second output~~instruction~~ are equivalent.

7. (Original) The fault-tolerant server of claim 6 wherein each I/O fault-tolerant logic comprises a comparator.

8. (Currently amended) The fault-tolerant server of claim 6 wherein each I/O fault-tolerant logic further comprises a buffer to hold at least one of the first output~~instruction~~ and the second output~~instruction~~ from at least one of the CPUs.

9. (Currently amended) The fault-tolerant server of claim 1 further comprising a voter delay buffer to store at least one of the first output~~instruction~~ and the second output~~instruction~~ upon a miscompare of the first output~~instruction~~ and the second output~~instruction~~.

10. (Currently amended) The fault-tolerant server of claim 1 further comprising a first delay module in electrical communication with the first local I/O module~~subsystem~~ to delay transmission of at least one output~~instruction~~ to the first local I/O module~~subsystem~~ and a second delay module in electrical communication with the second local I/O module~~subsystem~~ to delay transmission of at least one output~~instruction~~ to the second local I/O module~~subsystem~~.

11. (Original) The fault-tolerant server of claim 1 wherein the first computing element and the second computing element further comprise a 1U rack-mount motherboard.

12. (Currently amended) The fault-tolerant server of claim 1 wherein each respective local I/O module~~subsystem~~ is located on a same motherboard as the respective computing element.

13. (Currently amended) A method for a first computing element and a second computing element to execute in lockstep in a fault-tolerant server, the method comprising the steps of:

(a) establishing communication between the first computing element and a communications link, the communications link comprising a switching fabric, a first communications channel, and a second communications channel;

(b) establishing communication between the second computing element and the communications link;

(c) transmitting, by the first computing element, a first output~~instruction~~ to the communications link;

(d) transmitting, by the second computing element, a second output~~instruction~~ to the communications link; and

(e) comparing, by at least one of a local input-output (I/O) module~~subsystem~~ of the first computing element and a local I/O module~~subsystem~~ of the second computing element, the first output~~instruction~~ and the second output~~instruction~~ and indicating a fault of at least one of the first computing element and the second computing element in response thereto,

wherein the local I/O module~~subsystem~~ of the first computing element is in electrical communication with the local I/O module~~subsystem~~ of the second computing element via a sync bus to enable synchronization of the local I/O module~~subsystem~~, the synchronization of the local I/O modules providing a verification of state information about the first computing element and the second computing element.

14. (Currently amended) The method of claim 13 further comprising the step of transmitting a stop command to each computing element when the first output~~instruction~~ does not equal the second output~~instruction~~.

15. (Original) The method of claim 13 further comprising detecting an error introduced by the communications link.

16. (Original) The method of claim 13 further comprising assigning a priority to each respective computing element.

17. (Original) The method of claim 16 further comprising determining whether at least one of the first computing element and the second computing element is faulty based on the priority.

18. (Currently amended) The method of claim 16 further comprising determining whether the first output~~instruction~~ and the second output~~instruction~~ are equivalent.

19. (Currently amended) The method of claim 13 further comprising storing at least one of the first output~~instruction~~ and the second output~~instruction~~ from at least one of the computing elements for a predetermined amount of time.

20. (Currently amended) The method of claim 13 further comprising storing at least one of the first output~~instruction~~ and the second output~~instruction~~ upon a miscompare of the first output~~instruction~~ and the second output~~instruction~~.

21. (Currently amended) The method of claim 13 wherein the transmitting of the first output~~instruction~~ and the transmitting of the second output~~instruction~~ to the communications link occur simultaneously.

22. (Currently amended) An apparatus for enabling a first computing element and a second computing element to execute in lockstep in a fault-tolerant server, the apparatus comprising:

(a) means for establishing communication between the first computing element and a communications link, the communications link comprising a switching fabric, a first communications channel, and a second communications channel;

(b) means for establishing communication between the second computing element and the communications link;

(c) means for transmitting, by the first computing element, a first output~~instruction~~ to the communications link;

(d) means for transmitting, by the second computing element, a second output~~instruction~~ to the communications link;

(e) means for comparing, by at least one of a local input-output (I/O) module~~subsystem~~ of the first computing element and a local I/O module~~subsystem~~ of the second computing element, the first output~~instruction~~ and the second output~~instruction~~ and indicating a fault of at least one of the first computing element and the second computing element in response thereto; and

(d) means for synchronizing the local I/O module~~subsystem~~ of the first computing element and the local I/O module~~subsystem~~ of the second computing element, the synchronization of the local I/O modules providing a verification of state information about the first computing element and the second computing element.